

**Multiple Choice:** Solve each problem, choose the correct answer and then write your answer on the blanks provided. (1 point each)

B 1. The table to the right shows values for x and y. Which of these equations represents the relationship between x and y?

| x  | y      |
|----|--------|
| -3 | -128   |
| -2 | -32    |
| -1 | -8     |
| 0  | -2     |
| 1  | -0.5   |
| 2  | -0.125 |

- a.  $y = (-2)(.5)^x$   
 b.  $y = (-2)(.25)^x$   
 c.  $y = (2)(.25)^x$   
 d.  $y = (2)(.5)^x$

D 2. Which number has the least value?

- a.  $6^3$       b.  $6^{-3}$       c.  $2^{-3}$       d.  $-6^{-3}$

A 3. Simplify:  $\frac{7^9 \cdot 7^8}{7^{15}}$

- a. 49      b. 7      c.  $\frac{1}{7}$       d.  $\frac{1}{49}$

D 4. Which describes the result when a nonzero number is raised to the zero power and then that power is multiplied by a number greater than 1?

- a. the result is zero      b. the result is 1  
 c. the result is less than 1      d. the result is greater than 1

A 5. Simplify:  $\frac{-27x^5y^4}{-9x^3y^7}$

- a.  $\frac{3x^2}{y^3}$       b.  $-3x^2 - y^3$       c.  $\left(\frac{-3x}{y^3}\right)^3$       d.  $\frac{18x^2}{y^3}$

D 6. List the elements in order from least to greatest

- a. Sulfur, sodium, magnesium, chloride  
 b. Chloride, sodium, magnesium, sulfur  
 c. Sulfur, chloride, magnesium, sodium  
 d. Sulfur, magnesium, sodium, chloride

| Element in Seawater | Concentration (parts per million) |
|---------------------|-----------------------------------|
| Sulfur              | 904                               |
| Chloride            | $1.95 \times 10^4$ 19,500         |
| Magnesium           | $1.29 \times 10^3$ 1,290          |
| Sodium              | 10,770                            |

**Short answer: Solve each problem and put answers on the spaces provided. Show all work. Simplify each expression completely. Put your final answers in the blanks. (2 points each)**

7.  $(x^5y)^9(xz)^4$

$x^{45}y^9 \cdot x^4z^4$

$x^{49}y^9z^4$

8.  $2m^{-1}n^4p^2$

$\frac{2n^4p^2}{m}$

9.  $r^3 \cdot r^5 \cdot r^8 \cdot r^2$

$r^{18}$

10.  $\frac{-20x^5y^4}{-4x^3y^5}$

$\frac{5x^2}{y}$

11.  $\left(\frac{m^5}{m^2}\right)^{-4} \frac{m^{-20}}{m^{-8}}$

$\frac{1}{m^{12}}$

12.  $-4^0$

$-1$

13.  $(3b^{-2})^2(a^2b^4)^3$   
 $9b^{-4} \cdot a^6b^{12}$

$9a^6b^8$

14.  $\frac{60t^{-3}w^8}{15t^2wx^0}$

$\frac{4w^7}{t^5}$

15.  $(4a^3)(2a^5c^{10})$   
 $8a^8c^{10}$

$8a^8c^{10}$

16.  $(d^3)^5(d^3)^0$

$d^{15}$

Evaluate/Simplify each expression if  $a = 3$ ,  $b = -1$ , and  $c = 2$ :

17.  $5^b$

$\frac{1}{5}$

18.  $3^b a^2 y^c$

$\frac{9y^2}{3} = 3y^2$

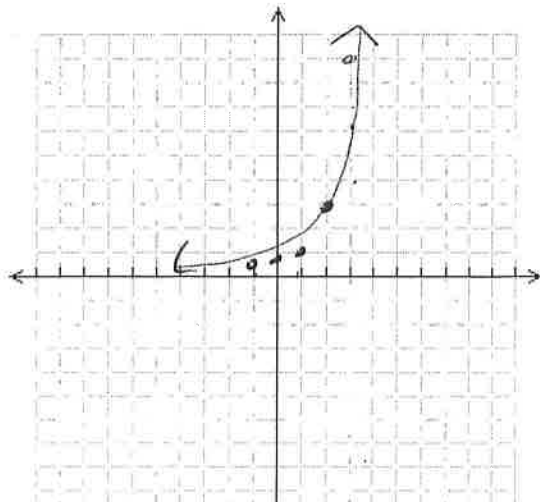
19.  $(12a)^c \cdot 12^2 (31)^2$

$1296$

**Evaluate each function below for the given values. Then graph each function. (5 points each)**

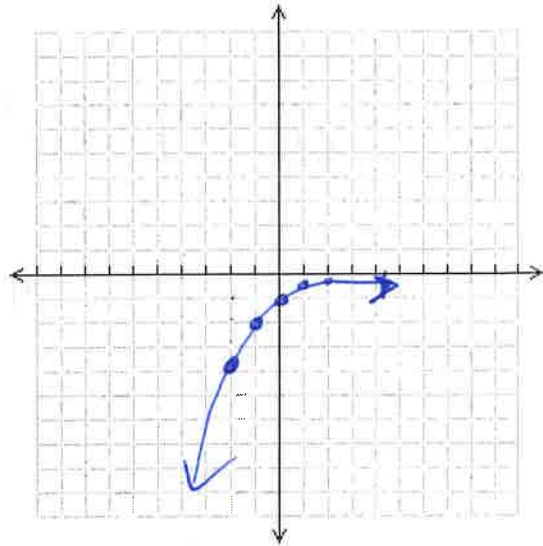
20.  $f(x) = \frac{1}{3} \cdot 3^x$

| x  | f(x)          |
|----|---------------|
| -1 | $\frac{1}{9}$ |
| 0  | $\frac{1}{3}$ |
| 1  | 1             |
| 2  | 3             |
| 3  | 9             |



21.  $y = -1 \cdot (0.5)^x$

| x  |  | y              |
|----|--|----------------|
| -2 |  | -4             |
| -1 |  | -2             |
| 0  |  | -1             |
| 1  |  | $-\frac{1}{2}$ |
| 2  |  | $-\frac{1}{4}$ |



Look over the following problems and correct the m correct answer. (2 points each)

22. 
$$\frac{12k^2m^3n}{9m^3n^6k^5} = \frac{12}{9} \cdot \frac{k^2}{k^5} \cdot \frac{m^3}{m^3} \cdot \frac{n^6}{n}$$

$$= \frac{4}{3} \cdot k^{-3} \cdot m^3 \cdot n^5$$

$$= \frac{4m^3n^5}{k^3}$$

23. 
$$2x^2y \cdot 3x^5y^2 = (2 \cdot 3)(x^2 \cdot x^5)(y \cdot y^2)$$

$$= 6x^{10}y^2$$

Explain Error: \_\_\_\_\_

Explain Error: \_\_\_\_\_

Correct answer: \_\_\_\_\_

$$\frac{-4}{3k^3n^5}$$

Correct answer: \_\_\_\_\_

$$6x^7y^3$$

**Extended Response:** For each extended response, you do not have to use the entire area of the grid space provided. Be sure that your answers are complete and all of your work is in the answer box.

24. In 1998 the population of Watauga was 35,000 people. The city is growing by 4% each year. Determine whether the function models exponential growth or decay and explain how you know. Write an equation that represents the situation. Using this function, estimate the population of the city in 2005 and predict the population of the city in 2018.

Use if needed

$y = a \cdot b^x$

$y = a(1+r)^x$

$y = 35000(1+0.04)^x$

$y = 35,000(1.04)^x$

1998  $t = 0$  2018

2005 is 7 yrs later  $t = 20$

$y = 35,000(1.04)^7$  76,689.31001

$\approx 76,689$

2005.  $\approx$  46,057

$46,057.61227$

25. The value of a new motorcycle is \$22,000 and depreciates 12% per year.

Write a function that models the value of the motorcycle after  $x$  years.

$$Y = 22,000(1 - .12)^x$$

Find the value of the motorcycle after 4 years.

$$Y = 22,000(.88)^4 \quad \$13,193.30$$

26. A new museum had 7400 visitors this year. The museum directors expect the number of visitors to grow by 6% each year.

Write a function that models the predicted number of visitors after  $x$  years.

$$Y = 7400(1 + .06)^x$$

Find the number of visitors that will visit the museum in 7 years.

$$Y = 7400(1.06)^7$$

11,126.86392  
 $\approx$  11,126 people

27. You have two choices of how to invest your money. You have \$4000 to invest.  $A = P(1 + \frac{r}{n})^{nt}$

- Bank A: 5% interest compounded **annually**
- Bank B: 3.25% interest compounded quarterly

a) How much money do you have with Bank A after 4 years?

$$A = 4000(1 + \frac{.05}{1})^{1(4)}$$

\$5105.13

b) How much money do you have with Bank B after 4 years?

$$A = 4000(1 + \frac{.0325}{4})^{4(4)}$$

c) Which bank should you choose?

Bank A

\$4552.92